Data Structure Recitation

Queue

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First in First out

Definition

Queue is a structure in which elements are added and removed from two ends; a "first in, first out" (FIFO) stucture.

Collection ADT

Definition

A queue is an example of a collection ADT. Collection is an object that holds other objects. Common operations on collections are inserting removing and iterating through the contents.

Three operations

- ▶ enqueue()
- ▶ dequeue()
- ▶ peek()
- ▶ * isEmpty()
- ▶ * isFull()

Exceptional Situations

- input value wrong type.
- overflow
- underflow

Array-Based

```
1  public class ArrayQueue<T>
2  {
3    protected T[] queue;
4    protected int numElements = 0;
5    protected int front = 0;
6    protected int rear;
7
8    public ArrayQueue(int maxSize)
9    {
10     stack = (T[]) new Object[maxSize];
11   }
12 }
```

Enqueue and Dequeue

- ▶ Move when reach end.
- ▶ Circular

Link-Based

```java
public class LinkedQueue<T>
{
  protected LLNode<T> front;
  protected LLNode<T> rear;

  public LinkedQueue()
  {
    front = null;
    rear = null;
  }
}
```

Circular Queue

Definition

A circular buffer, circular queue, cyclic buffer or ring buffer is a data structure that uses a single, fixed-size buffer as if it were connected end-to-end. This structure lends itself easily to buffering data streams.

Reverse a String (Not very efficient this time)

Reverse a string using a queue.
"abcdefg"$\rightarrow$"gfedcba"

Convert an Infix Notation to a Postfix Notation

Convert an Infix Notation to a Postfix Notation.
"1 + 2 - 3 * 4"→"1 2 + 3 4 * -".

Infix to Postfix (cont.)

1. If the token is an operand, append it to the end of the output queue.
2. If the token is a left parenthesis, push it on the opstack.
3. If the token is a right parenthesis, pop the opstack until the corresponding left parenthesis is removed. Append each operator to the end of the output queue.
4. If the token is an operator, *, /, +, or -, push it on the opstack. However, first remove any operators already on the opstack that have higher or equal precedence and append them to the output queue.